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Arthur D. Little Report

5/1/23 - Report on Coin Production

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SURVEY OF COINAGE PRODUCTION FACILITIES
BY ARTHUR D. LITTLE, INC.

INTRODUCTION

The major activity of the Bureau of the Mint is the production of domestic coins which are required for the nation's business transactions. Five denominations of coins, including cents, nickels, dimes, quarters and half dollars are currently being manufactured at coinage Mints at Philadelphia and Denver. Finished coins are delivered from the Mints to the 36 Federal Reserve Banks and Branches, and to the Office of the Treasurer of the United States in Washington. From these outlets, coins go to commercial banks throughout the country, and into circulation.

Coinage production has been subject to extreme variations during recent years with production ranging from a low point of 497 million pieces in fiscal 1950, to 3,461 million in fiscal 1962. Details of production are shown in the following table:

<u>Fiscal Year</u>	<u>Total Pieces</u>
1950	497,271,759
1951	1,157,820,778
1952	1,551,096,448
1953	1,619,562,894
1954	1,451,654,402
1955	936,871,253
1956	1,413,745,542
1957	1,899,739,340
1958	2,009,949,962
1959	1,570,768,816
1960	2,566,946,842
1961	3,058,791,188
1962	3,460,524,142
1963 (estimate)	3,700,000,000

During the most recent years there has been practically an insatiable demand for coins. Although the Mint established new production records for domestic coinage in both the fiscal years 1961 and 1962, with still another record anticipated for 1963, the nation has been plagued with coin shortages and rationing of available supplies, and many complaints have been received from all sections of the country regarding this very unsatisfactory situation.

As a result of the very substantial increase in coinage requirements during the past few years, and the consequent coin shortages despite record breaking production, arrangements were made for a study of coinage problems by a private management engineering consulting firm. Arthur D. Little, Inc., of Cambridge, Massachusetts, was employed by the Bureau of the Budget to study coinage requirements over the next twenty-five years, and to determine if present Mint facilities are capable of turning out the coins needed in future years.

The Survey of coinage problems was conducted between July 17, 1962, and January 16, 1963. During the course of the Survey, members of the consulting firm were in constant touch with Mint administrative and operating officials discussing various phases of the Mint's coin forecasting and production problems. These discussions were held in the Washington office, and in the Philadelphia and Denver Mints. In addition, a number of oral progress reports were given to officials of the Bureau of the Budget, Treasury and the Mint. These presentations, together with a series of Working Memoranda, kept the interested

officials informed of the progress being made by the consulting firm at all times. A final Survey Report was issued to the Director of the Bureau of the Budget on February 11, 1963.

In summary, the Survey firm has concluded that the demand for coins will continue to increase each year, and that present minting facilities are completely inadequate to produce the coins that will be needed in future years. They have made a number of recommendations for improved procedures in connection with the various manufacturing processes, but state that these recommendations cannot be adopted in the present Mint buildings because of the limitations of the present structures which are being used for production of coins.

This report deals with the principal recommendations made by the Survey company, and the action which the Mint feels should be taken in regard to each of those recommendations.

SURVEY RECOMMENDATIONS

Forecast of Coinage Requirements

The consulting firm has concluded that coinage production requirements will increase steadily at a rate of about $5\frac{1}{2}\%$ per year. From a level of 4.1 billion pieces needed in fiscal 1964, the requirement will increase to about 5.1 billion coins in 1970. In fiscal 1975, a total of 7.0 billion coins will be required, and this will increase to 17.8 billion during the fiscal year 1990.

The concept of a continuing increase in coinage production requirements, at a steady rate year after year, is in complete contrast to actual Mint operations during the past twenty-five years. During that time substantial fluctuations occurred in coinage demand, resulting in extreme variations in production schedules from one to three shift operations, sharp increases and decreases in employment, and the closing of one Mint. However, the approach taken by the Survey company in connection with this problem includes two important factors: (i) production should be maintained at a steadily increasing pace year after year with no unjustified production rate changes, and no production rate change costs; and (ii) the Mint should plan for an inventory of finished coins which will sometimes fall to zero, but occasionally rise as high as a two year (at present about 8 billion coins) supply.

Discussions were held on this subject with officials of the Board of Governors of the Federal Reserve System and a number of

Federal Reserve Banks. In addition, opinions were obtained from a representative sampling of National Bank officials throughout the country. In view of the above factors, and other information on this subject developed during the Survey, the Mint feels that the forecast of coinage requirements is on a sound basis.

Methodology of forecasting systems was presented in the report to provide information for the Mint to use in preparation of future annual forecasts. In addition, a representative of the Mint attended a seminar on forecasting methods, presented by Arthur D. Little, Inc., to obtain a better understanding of this problem.

Recommendations for Additional Space

Several alternative methods of providing additional space for expanded coinage facilities were considered. Three of these methods, which cost about the same amount but substantially less than the others, were presented as follows:

- {a) Constructing a new Mint in Philadelphia
- {b) Expanding the existing Philadelphia Mint
- {c) Closing both existing Mints and building a single new Mint.

Other recommendations on this subject included the following:

- (a) "We recommend that 200,000 square feet of new manufacturing space be provided as soon as possible". (p.3)
- (b) "Current manufacturing space in the Philadelphia Mint is unsatisfactory and should be abandoned", (p.3)
- (c) "The long lead time required to build manufacturing space and the continually increasing requirement for coins necessitate that initial steps to provide this space be taken immediately". (p.2)
- (d) "Because of long lead times for procuring this equipment, initial steps should be taken immediately". (p.3)

The greatest demand for coins is presently on the Eastern Seaboard, and Mint officials feel that new coinage facilities logically should be provided in Philadelphia. This gives recognition to the fact that 70% of the 3.5 billion coins made in fiscal 1962 were delivered to Banks nearest to Philadelphia. Because of this factor, and many related considerations, Mint officials feel that the first recommendation of the Survey, i.e., (a) constructing a new Mint in Philadelphia, should be adopted.

As a result of the above decision, the Treasury Department has transmitted to the Congress proposed legislation which would authorize the construction and equipping of buildings required in connection with the operations of the Bureau of the Mint. In his letter of transmittal, dated February 20, 1963, the Secretary of the Treasury informed the Congress that it was intended, under the authority that would be granted by the proposed legislation, to erect a new coinage Mint at Philadelphia to replace the existing Mint at that location.

Upon enactment of the proposed legislation, the Treasury plans to request an amendment to the 1964 budget to begin action on the project promptly. The proposed budget amendment would provide funds for land acquisition, architectural and engineering plans, and initial equipment costs. Funds for major equipment items, such as melting furnaces and rolling mills which affect structural design, should be available at the beginning of the fiscal year for obligation purposes. This would permit the Mint to enter into contracts for the major items which have to be provided for in the architectural drawings of the building.

Mint officials feel that a new Mint would be much more satisfactory than an expansion of the existing Philadelphia Mint. The expansion alternative would involve procurement of a tract of land adjacent to the Philadelphia Mint, probably under condemnation proceedings, removal of present buildings and construction of new manufacturing space for coinage production. The present Mint would be renovated at a cost of about \$1 million, and used for office space, and activities such as proof coin manufacturing, maintenance shops, etc. In 1950, when a new Mint was being considered for Philadelphia, the expansion alternative was investigated thoroughly by Mint officials, along with other plans. It was concluded at that time, and it is the opinion of present officials, that the expansion alternative would be an unsatisfactory arrangement.

Regarding the alternative of closing both existing Mints, and building a single new Mint, it is felt that the present investment in the efficient Denver Mint makes this an unsatisfactory choice.

Melting, Casting and Rolling

"We recommend that semi-continuous casting techniques be used". (p.3)

"* * * To process the larger ingot resulting from the proposed semi-continuous casting, a rolling mill line of much higher capacity (four to five times that of the present Philadelphia equipment) will be required". (p.59)

Top Mint officials are familiar with semi-continuous casting, having previously observed this operation in private industry. Adoption of a massive melting, casting and rolling complex, to handle twenty-five foot ingots weighing about 2,000 pounds, offers substantial possibilities for effective reductions in operating

costs. Careful consideration will of course be given to the application of this technological development to the manufacture of coins, giving attention to problems such as the need for intermediate strip or coil annealing, techniques of any required cleaning and edge rounding of the ingot, adherence to limited coinage tolerances, and related factors.

A related problem is the need for employees with more technical education and training to operate this type of equipment.

Recommendations for other Coin Production Processes

- (a) "The only other recommended change in manufacturing is greater use of mechanical material handling equipment, particularly conveyors". (p.17)
- (b) "At Philadelphia * * * copper is handled in palletized form. This technique should also be employed at Denver". (p.57)
- (c) "* * * although not economically feasible at present, changes in the form of metal received from suppliers (e.g., smaller pieces which can be bulk handled) may result in significant cost reductions in the future". (p.57)
- (d) Blanking - "We see no major innovations, except for more fully mechanizing the material handling". (p.60)
- (e) Upsetting - "* * * its material handling can be made more automatic". (p.60)
- (f) Counting and Bagging - "* * * recommend that a program be undertaken to develop equipment to improve the quality of inspection and reduce the labor costs of counting and bagging". (p.61)
- (g) "In summary, while we foresee no drastic departures from the current basic processes in the next decade, we do recommend significant changes in the melting, casting and rolling operations. These changes will result in lower costs and improved quality."

"Furthermore, in new or improved space, the advantages of automation can be realized". (p.61)

Generally speaking, Mint officials agree that all these suggestions and recommendations are on a sound basis, and should result in reductions in operating costs. As noted in the Report, the Mint has gone about as far in this general direction as possible within the confines of the present Mint buildings.

Utilization of Refining Space at Denver Mint

- (a) "* * * additional capacity should be provided at the Denver Mint by rearranging equipment, making use of currently unused refining space to accommodate a blank annealing furnace, adding a rolling mill and ten stamping presses". (p.3)
- (b) "At Denver * * * the addition of a third rolling mill will not only increase capacity but will result in a better quality product". (p.59)

The scope of the Mint survey was limited to the coinage activity, and did not include refinery problems, or the increasing backlog of unrefined bullion. The Mint does not agree with the suggestion for utilizing the refining space for coinage operations since refining is an essential function of the Mint. In addition, coinage operations would be seriously disrupted while the proposed changes were being made.

For some years, the Mint has followed the practice of shifting operating personnel between coining and refining operations at the Denver Mint, and at the former San Francisco Mint. Refineries were closed during periods of heavy coin demand, and reopened during periods of slack demand, with production workers being transferred between coinage and refinery operations. This procedure was adopted to eliminate reductions in force during periods of slack coin demand.

The coin demand has been increasing steadily for several years, and a decision has not been made to add a sufficient number of workers at the Denver Mint to operate the refinery, in addition to the number required for a full three-shift coining operation.

The Mint feels that the most practical way of expanding operations at the Denver Mint would be by an addition to the present building. Careful consideration should be given to the size of the addition and the amount of equipment to be installed, and the effect on the long-range recommendation: "After that time, (the next 10-15 years) it is likely that a new Mint facility will be required in Denver and changes in melting and casting methods and facilities can be made at that time". (p.59)

Large Inventory of Coins Needed

"We recommend that the Mint operate with a large inventory of finished coin or greater financial flexibility". (p.3)

The Mint agrees with the recommendation for large coin inventories, noting that the inventory will sometimes fall to zero, but occasionally rise as high as a two year supply (about 8 billion coins). The bulk of the inventory should be carried in the Federal Reserve Bank vaults, but about a third of a year's supply should be in Mint vaults. This would mean carrying an inventory in excess of 1 billion coins in Mint vaults.

It should be noted that at the present time the storage facilities in the Federal Reserve Banks, and in the Mints, do not have a sufficient capacity for the numbers of coins referred to above. It

appears that a coordinated long-range plan for expanded storage facilities should be developed with the Federal Reserve System.

Mint officials heartily endorse the concept of building large inventories of coins during slack demand periods, and depleting these inventories during periods of heavy demand. It has not been possible for the Mint to follow this logical approach to the problem in past years because of a tendency on the part of Budget reviewing authorities to make substantial reductions in Mint appropriations whenever coin inventories were accumulated. It is hoped that a long-range inventory program can be developed in line with this recommendation, which will not be affected by budgetary reductions due to temporary situations.

Financial Flexibility Required

"The second way to meet rapid demand increases is to give the Mint greater financial flexibility insofar as its operating budget is concerned". (p.48)

The General Accounting Office, in an audit report on the Bureau of the Mint issued in 1959, recommended that the Mint be financed from seigniorage and other revenues. This problem has been under consideration for sometime by Budget Bureau, GAO, and Treasury officials. Consideration was first given to direct financing from seigniorage and revenues, and later to use of a revolving fund, but these plans were discarded after thorough discussion of all of the problems that would be encountered. More recently, consideration has been given to the use of an emergency fund, to be financed from seigniorage. Under this plan, prior approval of the Secretary of

the Treasury and the Director of the Bureau of the Budget would be required before the fund could be used to supplement the Mint's regular operating appropriation.

Two Shift Operations

"From this analysis, we conclude that the Mint should operate its plants (either new or existing facilities) two shifts a day". (p.20)

For some years, operating officials of the Mint have recognized that production problems increase with the number of shifts worked. Problems become more complex on a three-shift operation, especially when the three-shift operations are extended to a sixth and seventh day, and the extra days are not on an overtime basis. The Mint feels that the analysis of this problem, as presented in the Report, is a logical solution when all factors are considered.

Present Productive Capacity

"We concur with the judgment of the Director of the Mint that 4.1 billion is about as high a rate as should be used in the current facilities. The Mint should operate at that rate until larger facilities are available". (p.32)

The Mint is seriously concerned over the age and condition of its production equipment, and the pounding that the equipment takes on the basis of a twenty-four hour operation. This schedule of continuous operations does not permit proper maintenance of equipment items, and seriously increases the danger of breakdowns. Failure of one or two key equipment items could put either Mint out of business for an extended period of time.

Even operating at the level of 4.1 billion coins in present facilities is a dangerous production plan, and the Mint feels that

this is the top level of production that should be attempted with the present equipment.

Management and Organization Recommendations

- (a) "We recommend that one of the assistants to the Superintendent of the Mint, at both Philadelphia and Denver, be an operating man or plant manager, to whom the division superintendents report". (p.46)
- (b) "Careful study should be given to the need for 'young blood' in the organization", (p.46)
- (c) "We believe that the Mint will be forced to raise its salary scales for technical and operating personnel in the future, and recommend that careful consideration be given to revising the classifications immediately". (p.47)
- (d) "What is needed is a closer tie between the Coin Management Division, the Accounting Division, and the production scheduling activities at the Mints * * *". (p.49)

As noted elsewhere in the Report, the Mint "is one organization which hasn't grown in size just for growth's sake". (p.45) This statement refers to the Washington office as well as the Mint field offices. The Mint is painfully aware of the age of some of its best technicians, and agrees that additional "young blood", and higher salaries for technical and operating personnel are extremely important. It is difficult for the Mint to attract technically qualified young employees at the salaries which can be offered under present Civil Service regulations.

The Mint will give careful consideration to the suggestions referred to above, and use the concept of a steady production level (eliminating fluctuations in employment) as the basis for taking a new look at this over-all problem.

CONCLUSION

Mint officials feel that Arthur D. Little, Inc., has accomplished an excellent job in their Survey of coinage requirements and production facilities. The recommendations included in the Report are considered sound and realistic, and are adequately supported by additional information presented in a series of Working Memoranda. This constructive study will be of continuing value to the Mint for use in connection with its long-range planning. The cost of the Survey is certainly justified by the excellent work of the consulting firm.

Iva Adams

Director of the Mint

April 4, 1963

January 15, 1957

Mr. Otto G. Klein
Office of Regional Director
General Services Administration
Denver Federal Center
Denver, Colorado

Dear Otter:

I am enclosing a copy of the letter which was sent December 17th last as our usual reminder to your agency of work requested and on which there has been no action.

I would call your attention to the fact that item No. 1, Construction of new truck entrance and receiving docks, has been abandoned as too costly. Inasmuch as there seemed little likelihood of our getting that type of work done we have, as you know, devised means of eliminating much of the traffic at our dock so that our No. 1 item on our agenda now is to chain-link fence the area which we are presently using for loading dock for shipping coin shipments. The cost of this item is insignificant compared to the first request, which was dated March 27, 1952, and yet, we seem unable to get this much simpler project completed.

We do thank you for razing the building on Delaware, but we are still doing the very hazardous loading of all coin shipments from a window into a public alley. Will you, therefore, give us your support in seeing that the matter of changing the city of Denver alley to our property and enclosing the area with fence and electrically operated remote controlled gates as soon as possible?

The No. 2 item on our list since August 3, 1952, and one of utmost urgency, remains; The Construction of an automatic passenger elevator. The number of janitors we have is far too limited for adequate care of this building, and on some occasions we have been without such help and the elevator has not been operated. Those on the third floor were forced to go up and down stairs and because of a heart condition of one of the Division Heads, we think it extremely dangerous not to have an automatic elevator. We know that you are aware of the great saving to be derived of having this type of elevator, and again wish to call to your attention that our request has been in a very long time for this equipment.

The other five items we have listed we have recently reviewed

with Mr. Greene, and he is aware of the urgency. All have been on the list of requested work for a number of years.

In addition, Mr. Greene has told us that as soon as the weather permits, we may hope for black-top surfacing for our two parking areas, both of which are extremely muddy.

Thank you very much for your interest in the matter, and we do hope that this year we may see the completion of these long-standing projects.

Very truly yours,

Superintendent

AKS:mc

Enc.

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